DOCUMENT RESUME

ED 268 512 CS 008 418

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TITLE How Does the Keyword Method Affect Vocabulary Comprehension and Usage? Report from the project on Studies in Language: Reading and Communication. Working Paper No. 278.
INSTITUTION Wisconsin Univ., Madison. Research and Development Center for Individualized Schooling.
SPONS AGENCY National Inst. of Education (DHEW), Washington, D.C.
PUB DATE Mar 80
GRANT OB-NIE-G-80-0117
NOTE 28p.
PUB TYPE Reports - Research/Technical (143)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS *Context Clues; Higher Education; Language Usage; Mnemonics; *Reading Comprehension; *Reading Research; Recall (Psychology); Sentence Structure; Teaching Methods; *Vocabulary Development; *Vocabulary Skills
IDENTIFIERS *Keyword Method (Language Learning)

ABSTRACT

Four experiments were conducted to determine how the keyword method of vocabulary instruction affects both subjects' comprehension of words encountered in sentences (experiments 1 and 2), and their ability to use words in appropriate sentences (experiments 3 and 4). In the first two experiments, college students were presented sentences containing previously presented words, and were asked to judge whether the words were correctly used in the sentences. In both experiments, some of the sentences made sense with the words and other sentences did not. In the second two experiments, college students placed the learned words in appropriate sentences. In the third experiment, correct usage was assessed by a modified cloze task, whereas in the fourth experiment it was assessed by subjects' construction of original sentences. Results supported previous research that showed the keyword method effective in facilitating students' recall of definitions, given words. In addition, this method was shown to increase comprehension of English vocabulary in context, as well as use of that vocabulary in a novel context. (HOD)

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ED268512

Working Paper No. 278

HOW DOES THE KEYWORD METHOD AFFECT VOCABULARY COMPREHENSION AND USAGE?

by

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Report from the Project on
Studies in Language: Reading and Communication

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March 1980

CS008418

Published by the Wisconsin Research and Development Center for Individualized Schooling.
The project presented or reported herein was performed pursuant to a grant from the National Institute of Education, Department of Health, Education, and Welfare. However, the opinions expressed herein do not necessarily reflect the position or policy of the National Institute of Education, and no official endorsement by the National Institute of Education should be inferred.

Center Grant No. 400-NIE-G-80-0117

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The Wisconsin Research and Development Center is supported with funds from the National Institute of Education and the University of Wisconsin.

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Abstract

The keyword method of vocabulary learning involves forming a linkage between a to-be-learned vocabulary word and a familiar English word that sounds like part of the to-be-learned item (the keyword). Then, the learner forms an interactive image between the keyword and definition referents. In previous research, the keyword method has been found to facilitate students' recall of definitions, given vocabulary items. In this study, use of the method was also shown to increase comprehension of English vocabulary in context, as well as usage of that vocabulary in a novel context.

How Does the Keyword Method Affect Vocabulary Comprehension and Usage?

Atkinson's (1975) keyword method of foreign vocabulary learning has been a recent focus of interest for both educational and cognitive psychologists. In brief, a learner using the keyword method engages in a two-step procedure. First, the learner transforms the unfamiliar vocabulary word into a familiar English word that sounds like part of the to-be-learned item (the keyword). Then, the learner forms an interactive mental image between the keyword and definition referents. Thus, to learn the Spanish vocabulary word carta which means letter, the learner could transform carta into cart and then imagine a shopping cart transporting a postal letter.

To date, the evidence has been overwhelming that the keyword method facilitates definition recall. In comparison to control subjects, students using the keyword method recall substantially more English translations (e.g., Atkinson, 1975; Pressley, 1977; Pressley & Levin, 1978; Pressley, Levin, Nakamura, Hope, Bispo, & Toye, in press). In addition, there is evidence to suggest that use of the keyword method promotes other aspects of foreign language learning, such as foreign word recall given the definition (Pressley & Levin, Note 1) and incidental recall of foreign word orthography (Pressley et al., in press, Experiment 5).

There is good reason to believe that the learning benefits associated with the keyword method will generalize beyond the foreign language situation. For example, investigators have applied the technique successfully to learning information about famous people (Jones & Hall, Note 2; Shriberg, Levin, & McCormick, Note 3), and to learning the states' capitals (Levin, Shriberg, Miller, McCormick, & Levin, 1980) and cities' products (Pressley & Dennis-Rounds, in press). Of particular relevance for the present investigation, the keyword method has also helped students learn definitions of unfamiliar words in their own language. Jones and Hall (Note 2) reported that a keyword method variation aided the definition learning of previously unfamiliar technical terms. However, there is much more to learning about new words than simply being able to generate definitions for them (see, for example, Johnson & Pearson, 1978; and O'Rourke, 1976). In particular, if the keyword method is to be recommended for inclusion in vocabulary development programs in schools, most educators would require that generalized improvements in vocabulary comprehension and usage--in addition to improved definition recall--be demonstrated. The primary goal of the present study was to determine how the keyword method affects such contextual measures of vocabulary acquisition. This represents an important empirical challenge to the keyword method, inasmuch as the present authors have frequently heard armchair critics of the method proclaim that it likely enhances simple vocabulary-definition associations

only at the expense of comprehension and usage. The four experiments reported here explore whether use of the keyword method affects both subjects' comprehension of vocabulary items encountered in sentence contexts (Experiments 1 and 2), and their ability to use vocabulary items in appropriate sentence contexts (Experiments 3 and 4).

Experiments 1 and 2

In the first two experiments, the effect of the keyword method on comprehension of vocabulary items in context was assessed. Subjects were presented sentences containing the previously presented vocabulary items, and were asked to judge whether the items were correctly used in the sentences. In both experiments, some of the sentences made sense with the vocabulary items in them and other sentences did not. Each sentence frame of Experiment 1 was constructed so that only one of the previously learned vocabulary items could be appropriately fit into it. In contrast, each sentence frame of Experiment 2 was constructed so that more than one vocabulary item would be appropriate. Of interest in the experiments was whether use of the keyword method would facilitate subjects' discriminations between correctly and incorrectly used vocabulary words in both narrowly defined (Experiment 1) and more broadly defined (Experiment 2) sentence contexts.

Method

Subjects. In both experiments, the subjects were students enrolled in introductory psychology courses at the University of

Western Ontario. All subjects were native English speakers. In Experiment 1, 16 students were randomly designated as keyword subjects, and 16 were control subjects. In Experiment 2, 14 and 15 students were randomly assigned to the keyword and control conditions, respectively.

Materials. In both experiments, the subjects were presented with the same list of 32 very low frequency English vocabulary words to learn. All of the items selected for use possessed an easily identifiable concrete (imageable) keyword in the first syllable (e.g., ham for the word hamate). Each word also had a concrete definition. No word was longer than three syllables. The words, gleaned from The Official Scrabble Players Dictionary (1978), were items considered to be obscure by two judges (i.e., words people generally do not know). These judgments were corroborated in an informal interview after the completion of Experiment 1. No subject indicated having known more than one of the items on the list before exposure to the words in the experiment and, typically, subjects knew none of the items before the experiment. The items used in these experiments are displayed in Table 1.

Insert Table 1 about here

Two other English words (carlin which means old woman and poteen which means Irish whiskey) were used to instruct subjects

in either the keyword or the control method, depending on the experimental condition.

All items were shown to subjects printed on 5" x 8" (12.7 x 20.3 cm) cards. The words were typed in capital letters. Both a vocabulary word and its definition (consisting of a few words) were printed on each card. The keyword portion of the vocabulary word was underlined on those cards presented to keyword subjects.

In Experiment 1, the test of vocabulary comprehension was constructed in the following manner. First, one correct sentence for each vocabulary item was generated. These sentences were constructed so that the correct vocabulary word for a sentence was the very best item from the set of 32 that could be used in that sentence (as determined by two judges). Based on Anderson's (1972) recommendation regarding the assessment of comprehension, the correct sentence for each word did not contain the verbatim wording used in the definition of the item. For example, the definition given for the word lapidist was a dealer in precious stones; its corresponding sentence was, "The lapidist laid out the collection of diamonds and rubies to decide which ones were the nicest."

The set of 32 sentences was divided into two (hereafter referred to as sets A and B), with 16 of the sentences randomly assigned to set A and 16 to set B. Then incorrect sentences for each vocabulary word were generated in the following manner. Within set A, each

vocabulary word in set A was randomly assigned to the sentence frame for some other item in set A. For instance, for the word cowry which means glassy seashell, the correct sentence was, "The little girl found a cowry when she was at the beach." The incorrect sentence for cowry was the lapidist sentence frame given above, namely: "The cowry laid out the collection of diamonds and rubies to decide which ones were the nicest." In turn, lapidist was placed in a sentence frame that was appropriate for another set A item. A set of incorrect set B sentences was similarly generated.

On the test, each subject was presented one of two forms of the test, either one containing correct set A sentences and incorrect set B sentences, or vice versa. The sentences were presented in the same order on the two forms of the test, with set A and set B sentences randomly interspersed throughout the list.

In Experiment 2, the sentences were constructed so that at least two of the 32 vocabulary words would be appropriate for use in each of the sentence frames. However, no frame was so indeterminate that all of the items would make sense in the sentence. Each vocabulary word appeared in three sentences on the test. For any given word, either 0, 1, 2, or 3 of the sentences were correct. Of the 96 test sentences, 46 contained vocabulary items that made sense in the context of the sentence.

Procedure. The same procedure was followed in both experiments. Subjects were told that they would be learning a list of unfamiliar

English words, and would later be tested on them. Consistent with some of our previous instructions (e.g., Pressley et al., in press), the specific nature of the subsequent vocabulary test was not indicated. Rather, subjects were told that any of a variety of vocabulary learning measures might be obtained, including recall of the definition given the vocabulary word, recall of the vocabulary word given the definition, sentence appropriateness judgments, or sentence construction. The ambiguity was built in so that subjects would be encouraged to learn the meanings of the words to their fullest, rather than rote vocabulary item-definition associations.

Keyword subjects were then instructed to use the keyword method to prepare for the vocabulary test. Using the sample items, carlin and poteen, the experimenter explained that the keyword (e.g., car, pot) would be underlined in each of the vocabulary words they would be asked to learn. Subjects were further instructed that they should construct an internal interactive image between the keyword and definition referents of each vocabulary word that would be presented. The subjects were given practice doing so using the two sample items, followed by experimenter queries concerning the particular interactive images they had generated.

Control subjects were instructed to try hard to remember the vocabulary items, but they were not given any specific strategy for learning them. The control subjects also practiced learning the two sample items.

Following the instructions and practice items, each subject was once again reminded that any of a variety of learning measures might be obtained after the items were presented. Then subjects were shown each vocabulary item at the rate of one every 10 seconds. The words were on index cards; the experimenter remained silent as they were shown. The words were presented in a different order to each subject, with the order determined by shuffling the deck of cards.

After all 32 items were presented for learning, subjects were given the test. On the test, subjects were presented the 32 (Experiment 1) or 96 (Experiment 2) test sentences. The subjects were instructed that it was their task to decide whether each vocabulary word was used correctly. They were told that if the sentence made sense with the vocabulary word in it, they should consider the sentence to be right and mark it as correct. If the sentence did not make sense, they were to consider it incorrect and mark it so. Subjects were instructed that they were to mark all sentences either correct or incorrect. They were not told how many items were correct on the test.

Results and Discussion

With the 32 narrowly defined test items of Experiment 1, keyword and control subjects averaged 90.2% and 74.0% correct identifications, respectively. The corresponding averages for the 96 broadly defined

test items of Experiment 2 were 72.9% and 64.5% for keyword and control subjects, respectively.

To correct each subject's score for his or her general endorsement tendency, both "hits" (acceptance of correctly used definitions) and "false alarms" (acceptance of incorrectly used definitions) were separately scored and then converted to z scores, based on the total sample in each experiment. A corrected measure of accuracy was then defined as $d = z_{\text{Hits}} - z_{\text{False Alarms}}$ for each subject (Baird & Noma, 1978). In both experiments, the mean d scores for keyword and control subjects differed significantly. In Experiment 1, the respective means were 1.00 and -1.00, $t(30) = 3.64$, $p < .005$; whereas in Experiment 2, the respective means were .67 and -.63, $t(27) = 2.49$, $p < .025$. The direction of the difference in both experiments indicated that keyword subjects were better able than controls to discriminate correctly used definitions from incorrectly used ones. Mean percentages of hits and false alarms for both experiments, as a function of experimental condition, are presented in Table 2.

Insert Table 2 about here

The results of Experiments 1 and 2 were consistent. Keyword subjects in both experiments comprehended vocabulary items in context better than control subjects, regardless of whether the item was

quite specific to a given sentence context or more generally appropriate to a number of sentence contexts.

Experiments 3 and 4

In Experiments 3 and 4, learners were presented more demanding tasks than those used in Experiments 1 and 2. The subjects in Experiments 3 and 4 were required to place the learned vocabulary words in appropriate sentence contexts. In Experiment 3, correct usage was assessed by a modified cloze task, whereas in Experiment 4, it was assessed by subjects' construction of original sentences.

Method

Subjects. In both experiments, the subjects were students enrolled in an introductory psychology course at the University of Western Ontario. Again, all subjects were native English speakers. In Experiment 3, 14 subjects were randomly designated as keyword subjects and 14 were controls. The corresponding sample sizes in Experiment 4 were 15 and 14, respectively.

Materials and Procedure. The same materials and procedures used in Experiments 1 and 2 were used in Experiments 3 and 4, with the exception of the testing portion of the experiments.

At testing in Experiment 3, subjects were presented 32 sentence contexts that were used for the test in Experiment 1. Each sentence contained a blank, corresponding to where the single correct vocabulary

item would appear in a complete sentence. The contexts were presented in the same order as the test sentences of Experiment 1. At testing, the subjects were also provided with a list of the 32 vocabulary words in alphabetical order. The subjects were instructed to place each vocabulary word in its (single) correct sentence context.

At test time in Experiment 4, the subjects were also given a list of the 32 vocabulary words in alphabetical order. The subjects were asked to write a sentence for each item. The sentence was to make sense with the vocabulary word in it, but subjects were specifically instructed not to simply write the definition. At the same time, they were told that sentences should be written in such a way that it would be possible to infer the meaning of the vocabulary word, given the sentence. The subjects were provided with illustrative sentences for the two sample items carlin (old woman) and poteen (Irish whiskey). For carlin the subjects were given the sentence, "The carlin fell on the ice and broke a bone because she was old and fragile." The sample sentence for poteen was, "The Irishman got very drunk from drinking poteen all night."

Each of the sentences written by subjects was scored by two independent judges who were "blind" to the experimental conditions to which the subjects were assigned. The judges scored a sentence as correct if the sentence made sense, and if it was possible to infer the meaning of the vocabulary word from the sentence. The two judges agreed on 95.5% of their judgments. On those items that

were scored differently by the two judges, a third judge determined whether the sentence satisfied the above specified criteria.

Results and Discussion

In both experiments, keyword subjects outperformed controls. In Experiment 3, keyword subjects correctly matched an average of 67.0% of the vocabulary items with their sentences, in comparison to 40.0% by control subjects, $t(26) = 3.81$, $p < .001$. In Experiment 4, keyword subjects averaged 47.5% correct sentence constructions, in comparison to 32.8% by control subjects, $t(27) = 2.14$, $p < .05$.

Thus, the results of Experiments 3 and 4 present another consistent set of findings. In both experiments, learners who were asked to place vocabulary items in a novel verbal context were able to do so better after having studied the items according to the keyword method than according to their own vocabulary learning strategies. This was true whether the contexts were provided by the experimenter (Experiment 3) or generated by the students themselves (Experiment 4).

General Discussion

Current methods textbooks on how to teach vocabulary (e.g., Johnson & Pearson, 1978; O'Rourke, 1976) make little mention of mnemonic techniques as aids to vocabulary learning. This is hardly surprising. There has been very little systematic research on mnemonics and vocabulary learning until recently (see Atkinson, 1975), despite popularizations of mnemonic techniques that would imply the contrary

(e.g., Lorayne & Lucas, 1974). Moreover, almost all of the positive data on the keyword method reflect simple associative recall of a definition, given the vocabulary item. However, data such as those presented here make it obvious that there is a place for mnemonic-based interventions in "a science of vocabulary development" (O'Rourke, 1976). Use of the keyword method appears to promote much more than a simple definitional response to a given vocabulary item. As was indicated in the introduction, we have recently found that the method facilitates recall of the vocabulary item itself, given the definition (Pressley & Levin, Note 1). And, as was demonstrated here, use of the technique facilitates performance on comprehension and usage tasks. These are certainly the kinds of tasks people are expected to be proficient at if they "know" a word and, thus, we are optimistic about the keyword method's potential for inclusion in educational programs on vocabulary learning.

Nonetheless, even though the results reported here are consistent with the hypothesis that use of the keyword method is generally helpful in learning vocabulary, unresolved questions remain. For instance, is the method helpful in learning vocabulary with a variety of characteristics? The items included for learning in these experiments were a fairly constrained subset of items from the English language. Each was a noun that possessed a concrete keyword syllable and a concrete definition. Would the keyword method be helpful

for vocabulary items from other grammatical form classes or for more abstract items? Two recently completed studies suggest the affirmative on both counts (Miller, Levin, & Pressley, in press; Pressley, Levin, & Miller, Note 4). Moreover, even though the keywords in these experiments were identical to one of the syllables in the to-be-learned vocabulary words, data from foreign vocabulary learning studies indicate that a keyword need only approximate one of the vocabulary word's syllables in sound (Atkinson & Raugh, 1975; Pressley et al., in press). Thus, it would seem likely that the word head could serve as a keyword for an item such as heteronomous. Finally, use of the keyword method is not limited to vocabulary items with single meanings. The method can easily be adapted for use with multiple-meaning items (Pressley et al., in press, Experiment 4). Based on data such as these, we would argue that the keyword method can be applied successfully to more than just a highly constrained set of words.

Another question immediately follows from the present findings. How would the keyword method fare relative to other procedures that have been recommended for improving vocabulary learning? In keyword studies to date, the performance of keyword method users has generally been compared with the performance of two types of control groups. In one type of control group, the subjects are not instructed in strategy usage, but are permitted to do whatever they would do

naturally to learn the vocabulary items, as in the present study. In a second type of control group, subjects are requested to use a verbal repetition strategy to learn the items (e.g., Raugh & Atkinson, 1975, Experiment 1)--a strategy frequently found to be interfering, relative to the first kind of control (cf. Pressley, Levin, Hall, Miller, & Berry, 1980). No studies, however, have been conducted in which the keyword method has been tested against alternative techniques that--from either theoretical or empirical considerations--are believed so facilitate vocabulary learning. For instance, it has been reported that vocabulary learning can be facilitated by presenting the vocabulary items in meaningful sentence contexts (e.g., Ehri, 1978; Gipe, 1979, 1980). Clearly, studies representing both keyword and context strategies are needed to determine which is relatively more helpful. Until such data are available, recommendations about the best strategy for improving vocabulary learning are premature.

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Table 1

Vocabulary Words Presented to Subjects

in All Four Experiments (Keywords Underlined)

Word	Meaning
Antiar	A poison used on arrows by natives
Bolter	A machine for sifting
Bullace	Purple plum
Bustard	A type of game bird
Casern	Barracks for soldiers
Catkin	A cluster of flowers
Claymore	A type of sword
Cordite	An explosive powder
Corniche	A road built on a cliff
Cotter	A tenant farmer
Cowry	A glassy seashell
Dogger	A fishing boat
Dottle	Half-burnt pipe tobacco
Fanfold	A type of writing pad or paper
Flamen	Priest of ancient Rome
Fumitory[a]	A climbing, vine-like plant
Gaskin	Part of the hind leg of a horse
Gunnel	A salt-water game fish

Table 1 (cont.)

Word	Meaning
Hamate	A wrist bone
Hosel	Part of a golf club
Inkle	A linen tape made for trimming garments
Jarvey	A carriage driver
Lapidist	One who deals in precious stones
Lawing	Bill for food or drink at a tavern
Lumper	A person who loads and unloads boats
Manchet	Small loaf of white bread
Padle	A hoe
Piggin	A small wooden pail
Ramekin	A dish made of baked cheese
Ratine	A heavy fabric
Tarn	Small mountain lake
Windling	Bundle of straw

[a]This item was inadvertently included in the list, and it is the only one whose intended keyword (fume) is not orthographically identical to the first part of the vocabulary word (fumitory).

Table 2

Mean Percentage of Hits and False Alarms in Experiments 1 and 2, As a Function of Experimental Condition

Experiment	Condition	Measure	
		Hits	False Alarms
1[a]	Keyword	89.4	9.0
	Control	78.1	30.1
2[b]	Keyword	65.4	20.1
	Control	57.4	28.9

[a]These figures are based on 16 correctly used and 16 incorrectly used definitions.

[b]These figures are based on 46 correctly used and 50 incorrectly used definitions.

Footnote

Part of this research was funded by the Wisconsin Research and Development Center for Individualized Schooling, supported in part as a research and development center by funds from the National Institute of Education (Center Grant No. OB-NIE-G-78-0217). The opinions herein do not necessarily reflect the position or policy of the National Institute of Education and no official endorsement by the National Institute of Education should be inferred. We are grateful to Lynn Sowle for typing the manuscript.